

OX-4159  
COPY 2 OF 2

October 25, 1962

TO:

STAT

FROM:

SUBJECT: Window Group Activities - 10/19/62 - 10/25/62

CC: Group Leaders

Non-Vacuum Window

[redacted] and is presently supervising the installation into the hatch of the two non-vacuum windows which were delivered to the Vehicle People in mid September, and is scheduled to conduct the initial flight test. No word has been received from him up to this time.

STAT

Vacuum Window

**Ultrasonic Welding:** The welding head which was reported as returned by Gulton last week was installed and found to be defective. It gave a response which indicated to us that the crystal was cracked. We were not able to obtain any welding with this head. The head was once again returned to Gulton and they examined it but found no fault. We received the head back here this morning and have been working with it all day. Up to now we have not been able to get any weld from the head, even though the amplitude of the horn under no load appears correct. If we are not able to discover the cause of difficulty by tomorrow evening, we plan to ask the Gulton serviceman to visit us as soon as possible.

**Hydrogen Brazing:** The hydrogen brazing of 7 x 10 foils is progressing very well. Five foils using the new band splice technique were made last week and all were found to be leak tight. Three foils have been delivered so far this week, but have not yet been tested. The production of 14 x 20 foils still has not reached the level of reliability of the 7 x 10 foils. Last week, during a furnace run, the furnace broke down and the brazing jig was badly oxidized. No further 14 x 20 runs can be made until the repairs to this jig are completed. As a result of tests conducted at Taylor-Winfield, which are discussed in a following paragraph, it was decided that the use of the hump back furnace for making 14 x 20 foils at Quality Heat Treat was not suitable, since it gave too high a surface resistance no matter what cleaning procedure was subsequently used on the foils. As a result, the furnace quality of other vendors was evaluated. All the necessary equipment for making 14 x 20 foils was removed from Quality Heat Treat and preliminary work at another vendor is now underway. The report summarizing the tests conducted on surface resistivity by different cleaning procedures for invar fired by various vendors, shall be distributed in a day or so.

**Resistance Welding:** A rather intensive program was carried out over the

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last several week at Taylor-Winfield to determine the cause of failure to produce tight welds in 7 x 10 frames. As reported previously, several shunting paths in the 7 x 10 jigs were found and corrected. This did not in itself produce a situation whereby tight foils could be made. The width of the weld was reduced by 1/3, and a study of welding parameters and weld quality as a function of the ratio of resistance between aluminum and invar was conducted. It was found that by far the best welds were accomplished when the resistance of aluminum to invar was in the ratio of one to three. Consistent surface readings of aluminum can be accomplished only when all the oxide is removed. The value of ten micro ohms was achieved consistently with a carefully controlled cleaning procedure. We found that abrasive cleaning of the invar, which has been used til now produced results which was inconsistent from piece to piece, and which were inconsistent from position to position on any one foil. Furthermore, only in rare instances were values of 30 micro ohms achievable by abrasive cleaning. We therefore developed a chemical cleaning procedure which was capable of producing resistivity readings which were consistent over any one piece, and found that the resistivity values varied greatly from piece to piece. This variation was attributable to the varying atmosphere and pretreatment of the hydrogen furnace used in making the foils and scrap invar. Those scrap pieces which were cleanable to a value of 30 micro ohms were used for making strip samples with aluminum, and were found to produce welds of exceptionally good quality. A leak tight frame, which had a surface brightness which indicated that it had a high probability of having a low surface resistance was selected and cleaned. It was found to have a uniform and low surface resistance at all the points measured. It was welded to aluminum face plates and the resulting leak check showed that the frame was tight. Based on this, I feel we can say that we have uncovered all the problem areas which have in the past prevented us from successfully attaching aluminum to the invar foils. We must, in the future, apply stricter controls to insure that the furnace environment is such that it will produce foils which will clean to a suitable surface resistivity. This control is being instituted. Furthermore, all the foils shall be carefully checked for their resistance values before any more welding is done.

I feel that we are over the hump in this area, and also feel that the knowledge which was gained in the last few weeks will allow us to go directly to making successful 14 x 20 aluminum to invar welds.

**Induction Welding:** The use of a different brazing alloy other than 409 has eliminated the corrosion problem we had experienced in the past. Several types of bellow seals have been made during the past week and produced some good welds and some poor ones. As a result, we have ordered some preformed brazing rings and an alloy which will wet a little better and we expect to successfully finish this phase within the next several days.

**Miscellaneous:** The Vac-Ion pump tests are under way, and about a week

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behind schedule due to difficulty in assembly of the glass apparatus and outgassing effects. A status report is being issued under separate cover.

The work on the reinforcing rib and mount for the 14 x 20 vacuum window is continuing.

Work has been started on investigating optimum cleaning parameters for aluminum as they apply both to the resistance welding and glass welding aspects.

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November 1, 1962

TO: FROM: 

SUBJECT: Window Group Activities - 10/26/62 - 11/1/62

CC: Group Leaders

Non-Vacuum Window

reports that the windows have been installed in the hatch successfully and that the first flight test was completed on October 30. The second flight test is being conducted today.

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Vacuum Window

Ultrasonic Welding: The welding head which was reported as not functioning last week was brought to Gulton on Monday. It was tested out on their test equipment as operating correctly. The 200 watt generator was also tested and found to be operating correctly. Since no reason for the inability to weld with the new horn could be found, it was decided that the fault must be somewhere in the new crystal since the horn was operating previously. A new crystal was applied by Gulton and the horn was reinstalled in our equipment yesterday. We are now getting good welds, except for slight chipping. To correct this chipping, we are carefully redressing the wheel and adjusting the alignment of the head. We are preparing for the welding of the 7 x 10 as quickly as possible.

Hydrogen Brazing: Seven 7 x 10 foils were produced during the last week at Quality Heat Treat, and were found to be vacuum tight. In the past two weeks we have produced 12 foils, all of which have been tight.

A facility was found which had a retort furnace with an atmosphere dry enough to produce 14 x 20 foils of satisfactory surface resistivity. A day was spent at that facility assembling a foil and running it through their furnace for the purpose of allowing them to evaluate part to be made for quoting purposes, and for us to be able to evaluate their facility. They are going to quote on making 14 x 20 foils. In the meantime an arrangement has been made whereby we shall do all the assembly of the foil here at our facility and bring them the completely assembled brazing fixture ready for insertion in the hydrogen bell jar. It is anticipated that one 14 x 20 foil per day can be made in this manner.

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November 1, 1962

The results on the resistivity checks on the material brazed at this facility indicated that their furnace was adequate.

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Resistance Welding: [redacted] returned to Taylor-Winfield and began work on attaching aluminum face plates to the tight foils recently made. They welded a foil on Wednesday and reported that the vacuum testing indicated that it was completely leak tight. This is the second leak tight foil made by this new process and it indicates that we have completely solved the problems involved in this process. Furthermore, the techniques developed are directly applicable to the 14 x w0 frames, and I anticipate minimum problems with those.

Induction Welding: We have perfected the technique of brazing the bellows to the frame. Using this new technique and all the associated fixturing that will be used with an actual frame, we have successfully brazed five out of five bellows. It is anticipated that during the next week the frames which have had aluminum attached to them will be upgraded to the next step, by having the reinforcing ribs attached to them and the bellows brazed in place.

All the jiggling is ready for welding the pump and the valve to the block. Several leak tight brazes have been made with the correct diameter tubing. Work is progressing so that similar brazes may be made to a simulated block, to study the effect of the heat sink.

The fixture for holding both the 14 x 20 and the 7 x 10 window in the bell jar in order to braze the tube to the bellows and subsequently the block to the tube has been fitted satisfactorily. Work is continuing on establishing our ability to braze the tube to the bellows.

Miscellaneous: A considerable amount of work was carried out on various methods of cleaning invar and aluminum. We are beginning to learn a great deal about how these materials must be cleaned in order to obtain a consistent and uniform surface resistivity. We are beginning to study the effects of residual contaminants which may be left on the surface after cleaning and which may outgas. Furthermore, we are beginning to apply careful cleaning procedures to the aluminum after it has been attached to the foil, so that we may optimize the aluminum to glass weld.

The Vac-Ion pump test is progressing very satisfactorily. Data has been gathered all week, and it is anticipated that the initial phase of this test will be completed in the next several days. A report shall be forthcoming.

The work on the reinforcing rib for the 14 x 20 window is continuing at a good rate. However, the mount, for thermal reasons has been made somewhat more complicated than originally anticipated when the schedule was made. I foresee that the mount will take longer than scheduled, but will be completed prior to the time when it is needed.

The test of the Granville-Phillips valve has been undertaken, and the first cycle has been completed. The second cycle will be finished tonight and the data shall be analysed to determine whether it is necessary to continue.

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November 8, 1962

25X1

TO:

FROM:

SUBJECT: Window Group Activities - Period 11/2/62 - 11/8/62

CC: Group Leaders

Non-Vacuum Window

Three instrumented flight tests were completed, and the data is presently being reduced. [ ] has returned from the [ ] and reports that the operation of the non-vacuum window appeared to be completely satisfactory under the present operating conditions. He is preparing a report on his activities during the last two weeks at [ ]

STAT

Vacuum Window

Transfer of our activity to the new Clean Room was accomplished over the weekend. It has taken several days to reinstall all the equipment, and this has manifested itself as some delay in our overall schedule.

Ultrasonic Welding: Work is continuing in an attempt to prepare for welding the 7 x 10 window. The horn appears to be operating satisfactorily.

Hydrogen Brazing: Three foils, No. 60 - 62 are in transit from Quality Heat Treat and are not indicated on our status report sheet. We felt that we have a sufficient supply of 7 x 10 foils on hand, and have suspended further fabrication of 7 x 10 foils.

Two 14 x 20 foils were made in the retort furnace at Kerns, Nos. 17 and 18, for the purpose of determining the correct furnace temperature. Foil No. 19 was brazed satisfactorily, appears to be cosmetically very good, but has not yet been leak checked. The retort furnace had to be repaired this week and is scheduled for operation again by late this afternoon. Foil No. 20 has been assembled and is at Kerns ready for Brazing.

The tight foils made previously at Quality Heat Treat shall be rerun in the Kerns Retort in an attempt to reduce the surface oxides to a level compatible with resistance welding requirements.

Resistance Welding: An attempt was made to attach aluminum face plates to 12 leak tight foils. The result was 10 successful frames. The reason for the two failures is as follows: one foil had gold runout on the face-

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plate, and the weld was attempted so as to determine whether foils such as this one were weldable. The second failure was due to an incorrect pressure setting on the machine. We now have 12 vacuum tight frames on hand. We feel that this is a sufficient number of frames for our purpose and we have suspended the construction of more 7 x 10 frames. We have begun to accumulate the materials and jigs necessary to weld aluminum faceplates to 14 x 20 frames. It is anticipated that we will be able to make our first weld in about one weeks time, and we anticipate no difficulty with this task.

Induction Welding: Work is continuing on this activity. Preparations for attaching bellows to the tight frames are now in progress.

Miscellaneous: Work is continuing on various cleaning methods.

A senior metallurgist was interviewed, but no job offer was placed.

A consultant from the Dictaphone Corporation was contacted and a preliminary interview is scheduled for next Wednesday.

The first phase of the vac-ion pump tests is complete and a report is being prepared. Verbal transmittal of the performance of the power supply was given to [ ] on Wednesday morning, and this power supply is being reworked in order to obtain a voltage curve which better optimizes pumping speed. It is obvious that considerable more testing shall have to be done on the vac-ion pump before we are satisfied that we have optimized its performance.

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The Granville-Phillips valve test is continuing. A 12 hour test at maximum temperature is now in progress.

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